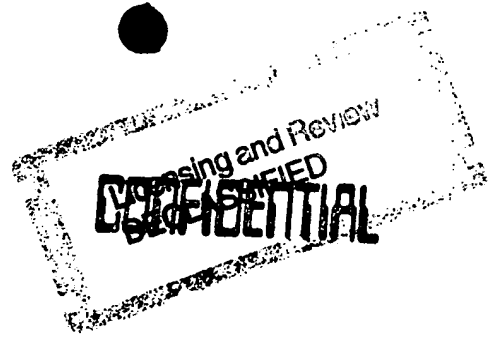


At line 18, delete "(115,116,153,149,139)".

At line 19, delete "(114,119A)".



IN THE CLAIMS

Please cancel claim 7 without prejudice or disclaimer.

In claim 19, at line 6, replace "cardle" with --cradle--.

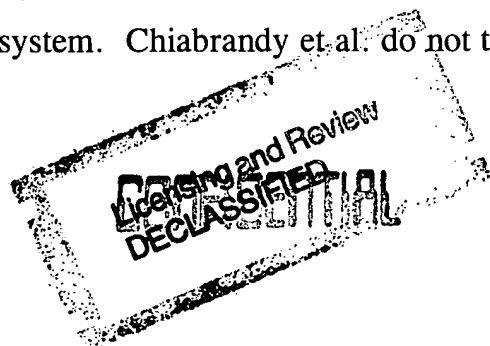
REMARKS

The Office Action, and the references relied upon, have been carefully considered. In an effort to expedite the prosecution of the present application, the Abstract has been amended to better conform to U.S. practice, claim 7 has been cancelled, and the typographical error in claim 19 has been corrected so that further rejection of claim 19 on the basis of 35 U.S.C. § 112 is not anticipated.

Prior to a discussion of the references cited against claim 19, the following will serve as a summary of the salient object of the invention. In accordance with the invention of amended claim 19, the structural members of which the cradle is formed are hollow so that they can accommodate gas for the hydraulic accumulator arrangement. This enables a larger volume of gas to be used without increasing the weight, which is of great importance when the field howitzer is to be a lightweight field howitzer. The significance of lightweight design is discussed on page 2, lines 8-13, page 3, lines 1-5, page 6, line 23 to page 7, line 1, and page 23, lines 27-24 of the disclosure.

In paragraphs 2 and 3 of the Office Action, the Examiner rejected all of the claims under 35 U.S.C. § 102(b), as being anticipated by Chiabrandy et al.

Claim 19 is directed to a field howitzer having a cradle which is constructed from hollow members. The space within the hollow members is used to accommodate compressed inert gas forming a part of the single hydraulic accumulator arrangement for a combined recoil buffer system and recuperator system. Chiabrandy et al. do not teach



the use of a cradle formed from hollow members as required by claim 19. Therefore, the cradle of Chiabrandy et al. cannot accommodate compressed inert gas as required by claim 19.

In the Office Action, the Examiner suggests that components 48, 98 and 100 of Chiabrandy et al. constitute a cradle with hollow members. This is not the case. In the art, it is well-known that a cradle is stationary with respect to the chassis and that the barrel moves with respect to the cradle during recoil and recuperation. The term "cradle", as used in the instant application, has a conventional meaning. In this regard, reference is made to page 20, line 33 to page 21, line 5, of Applicants' specification, from which it is clear that the barrel 101 moves axially with respect to the cradle (119, 119A) during recoil and recuperation. Thus, the cradle itself does not move during recoil and recuperation.

As discussed in col. 3, lines 18-20 of Chiabrandy et al., the cradle 106 is formed from structural members 128 and 130 formed of a channel construction to receive the sleigh rollers shown in Fig. 8b. These are not hollow members, as required in claim 19. Parts 48, 98 and 100, to which the Examiner refers, are not parts of the cradle. Rather, part 48 is a tube (see col. 2, line 56), as is part 50. Tubes 48 and 50 remain fixed relative to the cradle and mutually change places to act, in turn, as the loading and unloading chambers. These tubes are certainly hollow, but this is to accept round 580 (see Fig. 8b and col. 5, lines 1-3). Component 98 is the recoil brake housing and component 100 is the recuperator assembly (see col. 3, lines 3-5) and these move as a unit forming part of the recoiling mass. Thus, they are not part of the cradle.

Therefore, Chiabrandy does not anticipate claim 19.

In paragraphs 4 and 5 of the Office Action, the Examiner rejected the claims under 35 U.S.C. § 103, as being unpatentable over Seamands et al. in view of Williams.

Seamands et al. describe a combined recoil and recuperator system having characteristics which do not change as the hydraulic oil becomes heated in use (see col.

Copyright and Review
~~CONFIDENTIAL~~

1, lines 49-52). In this regard, the recoil characteristics would remain the same if the piston 56 separating the oil and gas always starts moving from the same point in the oil gas chamber 38, i.e., if it always abuts stop 54 when the gun is fired. However, under normal conditions, repeated firing causes heat to be generated in the oil (as it is compressed and forced through oil passage 40 and throttling slots 60 etc.) and, thus, the oil expands and forces piston 56 away from stops 54 thus altering the recoil characteristics. This problem is overcome by including replenisher cylinder 68 and second piston 72 which allows the expansion of the oil to result in additional compression of the gas via piston 72 while keeping piston 56 against stop 54.

When the gun is fired, piston 26 causes the oil to act on the end of control rod 58 forcing piston 56 to the right and some oil will also pass into cylinder 68 causing piston 72 to move to the right. Recuperation will take place preferentially via piston 56 as it has a larger area than the effective area of piston 72. As the oil heats up and expands, the increase in volume will be taken up by gradual movement of piston 72 to the right causing a slight increase in the gas pressure. As this occurs, rod 74 will protrude to the end wall of cylinder 68 to expose more of the indicia 76 which act as a measure of the oil temperature.

The Examiner suggests that Seamands discloses a cradle including hollow members 20 and 22. This is not so. The cradle is noted by reference numeral 20 and is clearly a solid body. Component 22 is the recoil unit (see col. 2, line 45). Certainly the recoil unit includes hollow regions, but this is not part of the cradle. On the contrary, it is a separate component which is fixed to the cradle. Thus, Seamands does not disclose a cradle constructed from hollow members, as required by claim 19.

Moreover, Seamands does not disclose that the gun is a field howitzer having a chassis and a trunnion support structure, as required by the claim.

Williams describes a howitzer including a barrel 12. However, there is no clear disclosure of a trunnion support structure, as required in accordance with claim 19. The

Copyright and Review
~~CONFIDENTIAL~~

Processing and Review
DECLASSIFIED

cradle 14 is merely indicated in Fig. 1 as being pivotally secured to carriage 16 (see col. 2, lines 52-54). Further, although Williams refers to howitzers, there is no mention of field howitzers as in the claimed invention. Moreover, although Williams does disclose the presence of a cradle 14, there is no suggestion that this is formed of hollow members as in the present invention. Indeed, Williams is primarily concerned with providing a self-locking hydraulic damper which extends or retracts as the gun is traversed, but locks solid when the gun is fired. No recoil/recuperator system is specifically described.

It is not seen that it would be obvious to combine the Seamands et al. and Williams references, and, in any event, such a combination would not result in the invention as claimed.

In paragraph 6 of the Office Action, the Examiner refers to other prior art but does not specifically rely upon it although he considers it to be pertinent. It is not seen that this further prior art is relevant to the patentability of the present invention.

Hooker is a historical account of the development of recoil/recuperator systems but contains no suggestion to use a cradle formed of hollow members to accommodate gas from a hydraulic accumulator system, as required in the present invention.

Fischer describes a standard 4.2 inch caliber chemical mortar (see col. 1, lines 8-10) having an inner barrel 13 slidably mounted inside an outer barrel 12. Piston 23 fast with the inner barrel 13 slides inside outer barrel 12 and acts on spring 35 on the hydraulic fluid surrounding it. Port 22 communicates with a second filter 29 and acts on a piston 31 to compress spring 38 in a gas type chamber. On firing, the recoil drives piston 23 downwards compressing spring 35 and forcing oil through port 32 to act on piston 31 and compress spring 38 and the gas surrounding it. Recuperation is effected by the extension of spring 35, 38, expansion of gas around spring 38, and reverse flow of oil through port 32. There is no cradle formed of hollow members as required in accordance with the claimed invention.

Processing and Review
DECLASSIFIED

CONFIDENTIAL
Examination and Review
DECLASSIFIED

Barnes describes a gun including a hydraulic buffer 17 to absorb the recoil forces. During recoil, combustion gases pass along pipe 12, through valve 14, and into cylinder 7. When the gas pressure in cylinder 7 is greater than in pipe 12, valve 14 closes. The gas pressure in cylinder 7 provides the recuperation force to return the gun to the battery position (Fig. 1). There is no hydraulic accumulator nor cradle constructed from hollow members in accordance with the claimed invention.

Voller is concerned with the problem of imbalance in guns due to the movement of the center of gravity as the recoiling mass oscillates backwards and forwards (page 1, lines 12-19, page 5 to 88). This is done by causing the recoiling brake (g, h) to move forward as the barrel (a) moves backwards. The position on recuperation is reversed. The masses moving forwards and backwards are roughly equal in magnitude so that the center of gravity effectively remains in the same position. In one embodiment, a hydraulic/pneumatic accumulator is provided (Figs. 2 and 3). However, there is no cradle constructed from hollow members to accommodate gas forming part of the hydraulic accumulator as required in accordance with the claimed invention.

Metz discloses a combined recoil/recuperator unit which is compact (col. 1, lines 28-31) which suggests that only a small volume of gas is being used. When the gun is fired, housing 11 and piston rod 10 are moved to the right, dragging piston 9 which forces oil 29 through openings 16, 26 and 23, so as to act upon the right-hand side of ring-shaped piston 7. Piston 7 moves to the left, compressing gas in an inner cylinder 8. Some of the gas in cylinder 8 is forced through a groove 5 in cylinder 1. Again, there is no suggestion to provide a cradle constructed of hollow members to accommodate accumulator gas as required in accordance with the claimed invention.

For the foregoing reasons, claim 19 is believed to be patentable, as compared with the cited prior art. The art neither anticipates nor presents a *prima facie* case of obviousness.

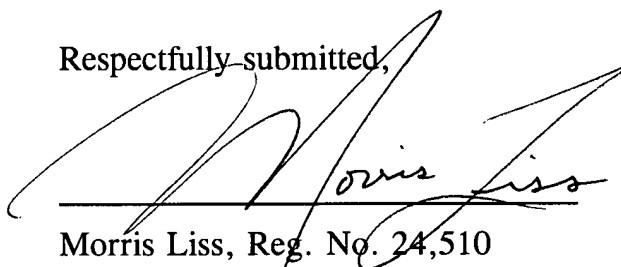
CONFIDENTIAL
Examination and Review
DECLASSIFIED

Reconsideration of the application, and favorable action thereon, are courteously solicited.

DEPOSIT ACCOUNT AUTHORIZATION

It is not believed that fees for net addition of claims are required, beyond those which may otherwise be provided for in documents accompanying this paper. However, in the event that additional fees are necessary, then any fees required for consideration of this paper, including fees for net addition of claims, are hereby authorized to be charged to our Deposit Account No. 22-0185.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Morris Liss", is written over a horizontal line.

Morris Liss, Reg. No. 24,510
Pollock, VandeSande & Priddy
1990 M Street, N.W.
Washington, D. C. 20036-3425
Telephone: 202-331-7111

Date: 9/3/96

